Flow Regulator
Type 45-9

Fig. 1 · Type 45-9 Flow Regulator

Mounting and Operating Instructions

EB 3128 EN

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Definitions of the signal words used in these instructions

CAUTION!
CAUTION indicates a hazardous situation which, if not avoided, may result in injury.

NOTICE
NOTICE indicates a property damage message.

Note: *Supplementary explanations, information and tips*

General safety instructions

- *The regulator must be installed, started up and serviced by fully trained and qualified personnel only, observing the accepted industry codes and practices. Make sure employees or third persons are not exposed to any danger.*
  All safety instructions and warnings in these instructions, particularly those concerning installation, start-up, and maintenance must be observed.
- *According to these mounting and operating instructions, trained personnel is referred to as individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the relevant standards.*
- *The regulator complies with the requirements of the European Pressure Equipment Directive 97/23/EC. The declaration of conformity issued for a valve bearing the CE marking includes information on the applied conformity assessment procedure and will be provided on request.*
- *To ensure appropriate use, only use the regulator in applications where the operating pressure and temperatures do not exceed the operating values specified in the order.*
  Note that the manufacturer does not assume any responsibility for damage caused by external forces or any other external factors.
  Take appropriate safety precautions to prevent hazards that may be caused in the regulator by the process medium, operating pressure, or moving parts.
- *Make sure the regulator is shipped and stored properly.*

Note: *The non-electric actuators and control valve versions do not have their own potential ignition source according to the ignition risk assessment stipulated in EN 13463-1: 2009, section 5.2, even in the rare incident of an operating fault. Therefore, they* ***do not*** *fall within the scope of Directive 94/9/EC. For connection to the equipotential bonding system, observe the requirements specified in EN 60079-14: 2008 (VDE 0165 Part 1), section 6.3.*

1 Design and principle of operation

The flow regulator consists of the valve body with a restriction (orifice), seat and plug as well as the closing actuator with an operating diaphragm.

The regulator is typically used in heating and district heating systems to maintain the flow rate at the adjusted set point.

The medium flows through the valve in the direction indicated by the arrow on the valve body. The flow rate is determined by the area released between the restriction (1.2) and valve plug (3). The integrated spring (5) determines the upper differential pressure across the restriction (either 0.2 or 0.3 bar).

The high pressure upstream of the orifice (1.2) is transmitted to the high-pressure side of the actuator through the attached control line (11).

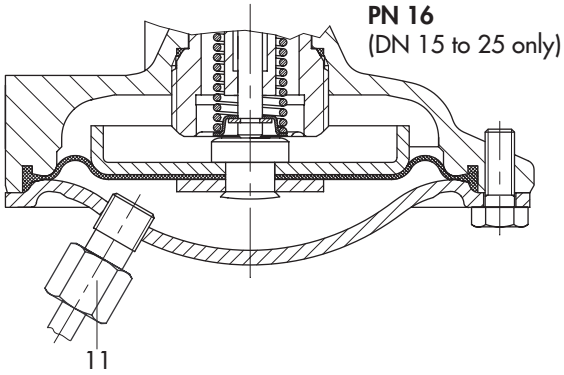
The low pressure downstream of the orifice acts on the low-pressure side of the operating diaphragm (6.1) through a bore in the valve plug.

The differential pressure produced by the restriction is converted into a positioning force at the operating diaphragm.

This force is used to position the valve plug against the force of the positioning spring(s) (5).

Table 1 · Tightening torques

Nominal size	**Item 3** Guide nipple	**Item 6.2** Screws	**Item 1.2** Orifice
DN 15 to 25	70 Nm	8 Nm	70 Nm
DN 32	110 Nm	8 Nm	110 Nm
DN 40 and 50	110 Nm	18 Nm	110 Nm



1 Valve body
1.1 Connection nut with sealing ring and welding end
1.2 Restriction (orifice)
2 Seat
3 Guide nipple with plug assembly
4 Plug stem
5 Positioning spring(s)
6 Actuator
6.1 Operating diaphragm
6.2 Screws
11 Control line
16 Lock nut
17 Set point screw
18 Cap

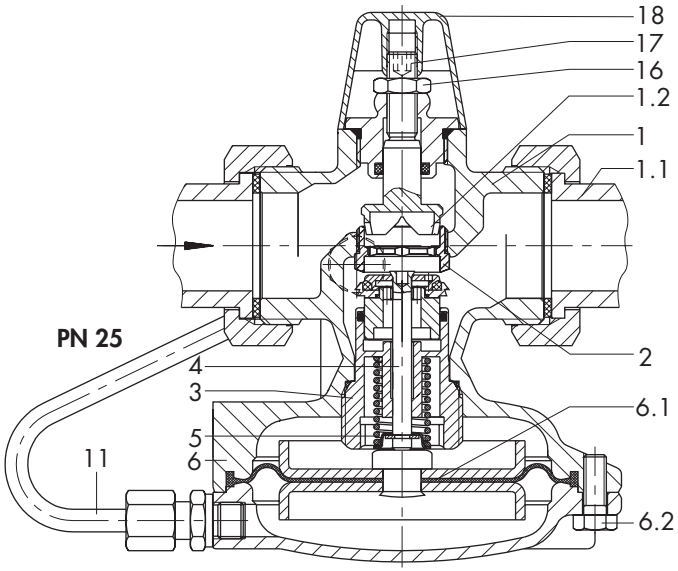


Fig. 2 · Sectional drawings

2 Installation

NOTICE
Protect the regulator against frost when controlling freezing media.
When used in a room not free of frost, remove the regulator when the plant is shut down.
Prior to removing the regulator, make sure the relevant section of the plant has been depressurized and drained.

2.1 Mounting position

Install the regulator in a horizontal pipeline with the actuator suspended downwards. Use the connection nuts with welding ends included in the delivery to install the regulator.

Make sure that the medium flows through the valve in the direction indicated by the arrow on the valve body.

2.2 Strainer

Install a strainer (e.g. SAMSON Type 1 NI) upstream of the regulator to prevent sealing particles, weld spatter, pipe scale, and other impurities carried along by the process medium from impairing the proper operation, especially the tight shut-off of the regulator. Make sure that the medium flow corresponds with the direction indicated by the arrow on the strainer body. Install the strainer with the filter element suspended. Ensure that ample space is available to remove the filter.

2.3 Additional installation instructions

We recommend installing hand-operated shut-off valves both upstream of the strainer and downstream of the regulator. This allows the plant to be shut down for cleaning or maintenance purposes. Install pressure gauges both upstream and downstream of the regulator in order to monitor the pressures prevailing in the plant.

3 Operation

3.1 Start-up

Note: *Before starting up or pressurizing the regulator, make sure the orifice (1.2) is open.*

For this purpose, retract the actuator stem of the electric actuator using the handwheel or by applying a control signal.

Disconnect electric actuators with fail-safe action from the power supply before disassembling them in order to be able to open the orifice.

Slowly fill the plant on start-up.

When pressure-testing the plant, make sure the test pressure does not exceed 1.5 times the nominal pressure.

3.2 Adjusting the set point

Proceed as described below to adjust or change the flow set point:

Unscrew the cap (18), unthread the lock nut (16) and turn the set point screw (17):

- Turn the screw clockwise to reduce the flow rate.
- Turn the screw counterclockwise to increase the flow rate.

Use the diagram (Fig. 3) as a guide to adjust the flow rate. Note, however, that the required number of turns of the set point screw is based on a closed orifice (1.2).

Table 2 · Flow set points

Nominal size	DN	15				20	25	32	40 [2]	50 [2]
K_{VS} coefficient		0.4 [1]	1 [1]	2.5 [1]	4	6.3	8	12.5	16 20 [3]	20 25 [3]
Flow set point range [m³/h] with an upper diff. pressure	0.2 bar	0.01 to 0.2	0.02 to 0.64	0.02 to 1.2	0.1 to 2.5	0.1 to 3.6	0.1 to 5	0.3 to 10	0.4 to 12.5	0.4 to 15
	0.3 bar	–	–	–	0.1 to 3	–	–	–	–	–

[1] Special versions

[2] Also available with flanged body

[3] K_{VS} for flanged body

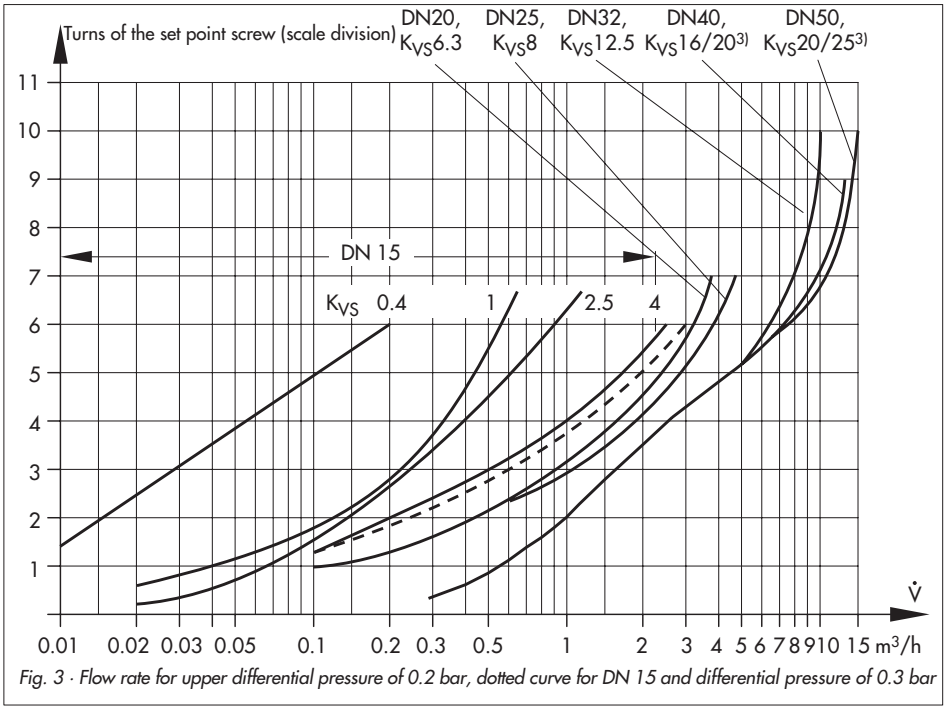


Fig. 3 · Flow rate for upper differential pressure of 0.2 bar, dotted curve for DN 15 and differential pressure of 0.3 bar

Refer to the nameplate on the regulator or to Table 2 to find out the adjustable set point range of the relevant nominal size.

All flow rate curves refer to an upper differential pressure across the restriction of 0.2 bar, except for the dotted curve which refers to an upper differential pressure of 0.3 bar.

Different K_{VS} coefficients are available for valve size DN 15 to provide several flow set point ranges.

When the required flow rate is reached, retighten the lock nut and screw the cap (18) back on. For the **special version with a scaled cap**, the set point can be adjusted directly using the scaled cap (one marked scale division corresponds to one turn of the set point screw).

4 Maintenance · Replacing parts

The flow regulator is maintenance free. Nevertheless, it is subject to natural wear, particularly at the seat, plug and operating diaphragm.
Depending on the application conditions that prevail, inspect the regulator at appropriately scheduled intervals to avoid possible malfunctions.
If the regulator does not close tightly, this may be caused by a dirty seat or plug or due to natural wear.
If the flow rate deviates considerably from the adjusted set point, e.g. rapidly increasing flow rate, check the operating diaphragm for ruptures and replace it if necessary.

CAUTION!
In case of high temperatures, first allow the pipeline to cool down to ambient temperature.

4.1 Cleaning or replacing the plug

1. Remove the regulator from the pipeline.
2. Unscrew the control line (11).
3. Unthread the screws (6.2) and remove the bottom diaphragm case together with the operating diaphragm (6.1) and diaphragm plate.
4. **For valve sizes DN 15 to 25:**
   Unscrew and remove the guide nipple of the plug assembly (3) using a socket wrench (order no. 1280-3001).

   The socket wrench can be made from a Gedore screwdriver bit (IN 19-19), for example, by drilling a 17 mm hole with a 17 mm diameter into a 19 mm hexagon bit (Fig. 4).
   For valve sizes DN 32 to 50:
   Unscrew the stopper first and then pull out the plug assembly.
5. Thoroughly clean the seat and plug assembly. Check the control line for any

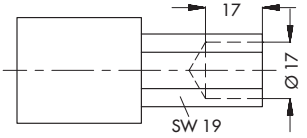


Fig. 4 · Socket wrench

blockages. If the plug is damaged, replace the complete plug assembly.

To reassemble the regulator, proceed in reverse order.

NOTICE

On reassembling the regulator, make sure that the diaphragm is aligned properly in the body groove before refastening the regulator.

Use the tightening torques listed in Table 1 (Fig. 2).

4.2 Replacing the diaphragm

1. Remove the regulator from the pipeline.
2. Unscrew the control line (11).
3. Unthread the screws (6.2) and remove the bottom diaphragm case together with the diaphragm (6.1) and diaphragm plate.
4. Replace the diaphragm together with the diaphragm plates.

To reassemble the regulator, proceed in reverse order.

5 Customer inquiries

SAMSON's after-sales service can provide assistance in the event of malfunction or any faults. In cases of doubt, contact SAMSON.

You can also send the defective regulator directly to your local SAMSON representative for repair. Addresses of SAMSON subsidiaries, agencies and service centers are listed in the product catalogs and in the Internet at www.samson.de.

To allow SAMSON to find the fault and to have an idea of the installation situation, specify the following details (refer to the nameplate):

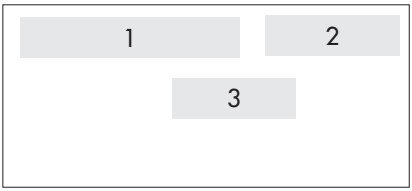
- Type and nominal size
- Threaded or flanged end connection
- Model number
- Upstream and downstream pressures
- Flow rate in m^3/h
- Has a strainer been installed?
- Installation sketch

6 Troubleshooting

Table 3 · Troubleshooting

Fault	Possible reasons	Solution
The flow rate exceeds the set point	Leakage between seat and plug	Remove the valve. Clean the seat and plug. If necessary, replace the plug (section 4.1). Otherwise, return device to SAMSON for repair.
	Operating diaphragm defective	Replace the diaphragm (section 4.2) or return the device to SAMSON for repair.
	Control line blocked	Remove the control line and clean it.
	Valve is too large for the control task	Recalculate K_{VS} and contact SAMSON.
The flow rate does not reach the set point	Incorrect set point range selected	Check the set point range and contact SAMSON.
	Safety device, e.g. pressure regulator, has been triggered	Check the plant and unlock safety device.
	Insufficient differential pressure across the plant	Compare the existing differential pressure across the plant with the plant drag. Min. diff. pressure = Upper differential pressure + $(\dot{V}/K_{VS})^2$
	Strainer blocked	Empty the strainer filter and clean it.
	Valve is installed incorrectly	Install the valve so that the medium flows through it in the direction indicated by the arrow.
Control loop is unstable	Valve is too large for the control task	Recalculate K_{VS} and contact SAMSON.

7 Nameplate



1 Configuration ID (Var-ID)
2 Type designation
3 Date of manufacture

Entries in the other fields:
K_{VS} or C_V
Upper differential pressure in bar or psi
Set point range of flow rate m^3/h
Max. perm. temperature °C or °F
Max. perm. differential pressure Δp
Nominal pressure PN or ANSI Class

Fig. 5 · Nameplate

8 Dimensions and weights

Table 4 · Dimensions

Nominal size DN	15	20	25	32	40	50
Pipe inside Ø d	21.3	26.8	32.7	42	48	60
Connection D	G ¾	G 1	G 1 ¼	G 1 ¾	G 2	G 2 ½
Width across flats SW	30	36	46	59	65	82
Length L	65	70	75	100	110	130
Height H	65			85	85	
Height H3	85			105	140	
Diameter D	116				160	
Welding ends L1	210	234	244	268	294	330
Weight, approx. in kg	1.6	1.7	1.8	3	5.5	6
Special version with threaded ends (male thread)						
Length L2	129	144	159	180	196	228
Male thread A	G ½	G ¾	G 1	G 1 ¼	G 1 ½	G 2
Weight, approx. in kg	1.6	1.7	1.8	3	5.5	6
Special version with flanges PN 16/25 or version with flanged valve body (DN 32 to 50)						
Length L3	130	150	160	180	200	230
Weight	3	3.7	4.3	6.2	9.5	11

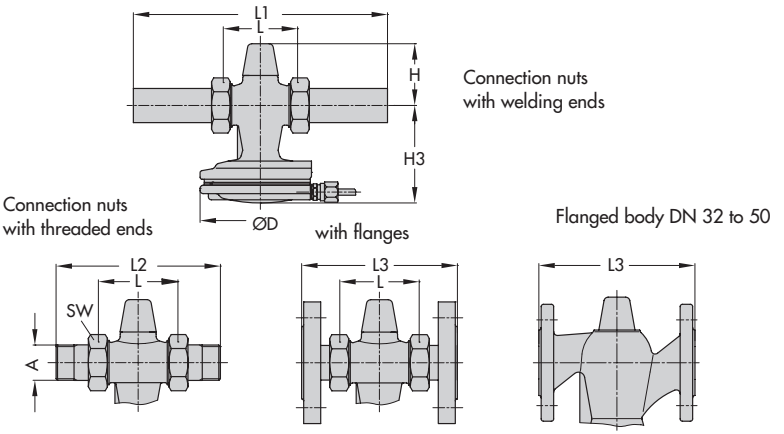


Fig. 6 · Dimensional drawings

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